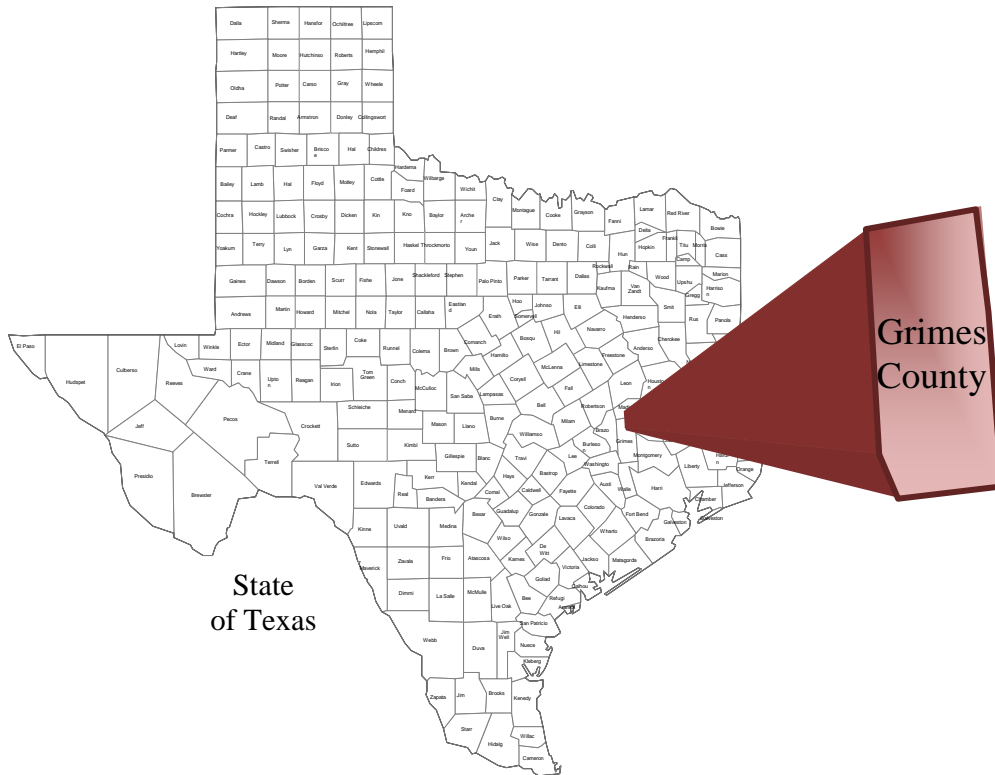


The Economic Impact of Health Services on the Economy of Grimes County, Texas



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National Association of Counties Project
Funded by the federal Office of Rural Health Policy

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through

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Medical facilities have a tremendous medical and economic impact on the community in which they are located. This is especially true with health care facilities, such as hospitals and nursing homes. These facilities not only employ a number of people and have a large payroll, but they also draw into the community a large number of people from rural areas that need medical services. The overall objective of this study is to measure the economic impact of health services on the economy of Grimes County. The specific objectives of this report are to:

1. discuss national trends in health care;
2. review county demographic and economic data;
3. summarize the direct economic activities of health services in Grimes County;
4. review concepts of community economics and multipliers;
5. estimate the economic impact of health services on the economy of Grimes County.

No recommendations will be made in this report.

National Health Trend Data

The health care services is an extremely fast-growing sector in the United States, and based on the current demographics, there is every reason to expect this trend to continue.

Data in **Table 1** provide selected expenditure and employment data for the United States.

Several highlights from the national data are:

- In 1970, health care services as a share of the national gross domestic product (GDP) were 7.2 percent and increased to 16.0 percent in 2006;
- Per capita health expenditures increased from \$356 in 1970 to \$7,026 in 2006;

Table 1
United States Health Expenditures and Employment Data
1970-2006; Projected for 2008, 2011, 2014 & 2017

United States Data					
Year	Total Health Expenditures (\$Billions)	Per Capita Health Expenditures (\$)	Health as % of GDP (%)	Health Services Employment (000)	Avg. Annual Increase in Employment (%)
1970	\$74.9	\$356	7.2%	3,052 ^a	
1980	253.4	1,100	9.1%	5,278 ^a	7.3%
1990	714.0	2,813	12.3%	7,814 ^a	4.8%
2000	1,353.6	4,790	13.8%	10,858 ^a	3.9%
2001	1,469.6	5,148	14.5%	11,188 ^a	3.0%
2002	1,603.4	5,560	15.3%	11,536 ^a	3.1%
2003	1,732.4	5,952	15.8%	11,817 ^b	N/A
2004	1,852.3	6,301	15.9%	12,055 ^b	2.0%
2005	1,973.3	6,649	15.9%	12,314 ^b	2.1%
2006	2,105.5	7,026	16.0%	12,602 ^b	2.3%
Projections					
2008	2,394.3	7,868	16.6%		
2011	2,905.1	9,322	17.4%		
2014	3,523.6	11,043	18.4%		
2017	4,277.1	13,101	19.5%		

SOURCES: 2008 Bureau of Labor Statistics; 2008 Bureau of Economic Analysis; 2008 Centers for Medicare & Medicaid Services, National Health Expenditures 1970-2006 and National Health Expenditure Projections 2007-2017 (<http://www.cms.hhs.gov/NationalHealthExpendData> [March 2008]).

N/A - Not Available.

^a Based on Standard Industrial Classification (SIC) codes.

^b Based on North American Industry Classification System (NAICS).

- Employment in health services increased almost 313.0 percent from 1970 to 2006; and
- Annual increases in employment from 2003 to 2006 ranged from 2.0 percent to 2.3 percent.

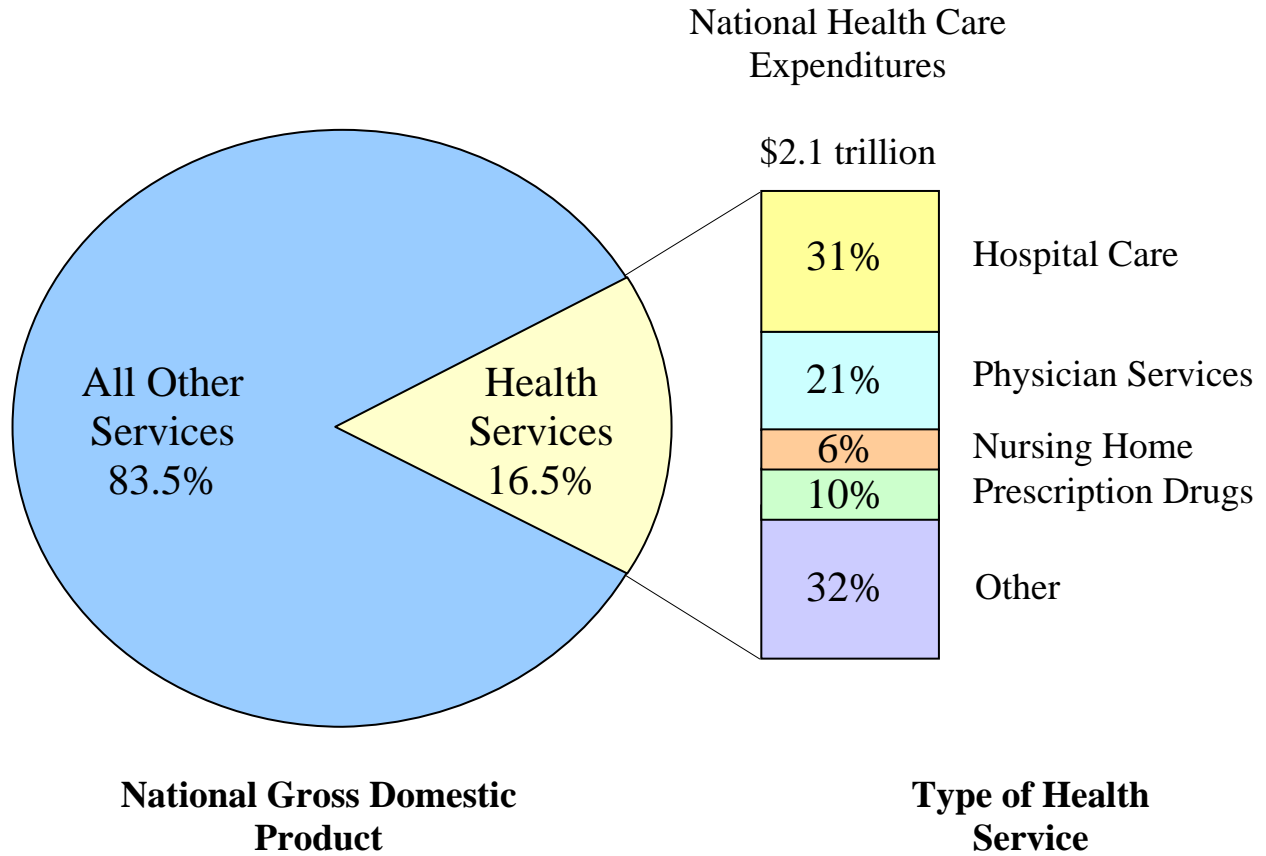
The U. S. Department of Health and Human Services, Centers for Medicare and Medicaid Services, predicts that health care expenditures will account for 18.4 percent of GDP by 2014 and increase to 19.5 percent of GDP in 2017. Per capita health care expenditures are projected to increase to \$11,043 in 2014 and to \$13,101 in 2017. Total health expenditures are projected to increase to almost \$4.3 trillion in 2017.

Figure 1 illustrates 2006 health expenditures by percent of gross domestic product and by type of health service. The largest health service type was hospital care, representing 31 percent of the total. The next largest type of health services was physician services with 21 percent of the total.

County Demographic and Economic Data

The study is based on the medical service area that includes all of Grimes County, Texas. Grimes County is located in the south central part of Texas. The populations for cities in Grimes County, Grimes County itself, and the state of Texas are illustrated in **Table 2**. Navasota city is the county seat of Grimes County and is the largest population center in the county. There are only two other very small cities, Anderson city and Todd Mission city, in Grimes County. Navasota city had a population of 6,296 in 1990 which increased to 6,789 in the 2000 census, representing a increase of 7.8 percent. The 2006 estimated population for Navasota city was 7,378, representing an expected increase of 8.7 percent from the 2000 census. The unincorporated areas (balance) of the county increased 31.1 percent from 1990 to 2000 and these

Figure 1
National Health Expenditures
As a Percent of Gross Domestic Product
and by Health Service Type, 2006



areas are expected to continue to increase another 8.4 percent from 2000 to 2006. Grimes County increased 25.1 percent in population from 1990 to 2000 and is estimated to have increased an additional 8.5 percent from 2000 to 2006 and 8.7 percent from 2000 to 2007. The state of Texas experienced the same trends as the county for the census time periods and is also expected to increase from the 2000 census through the estimated population years of 2006 and 2007.

Table 2
Census Population, Estimated Population, and Percent Changes
for Grimes County and the State of Texas

	<u>Census Population</u>		<u>Estimated Population</u>	
	1990	2000	2006	2007
Anderson city	NA	257	277	NA
Navasota city	6,296	6,789	7,378	NA
Todd Mission city	54	146	159	NA
Balance of County	<u>12,478</u>	<u>16,360</u>	<u>17,738</u>	<u>NA</u>
Grimes County	<u>18,828</u>	<u>23,552</u>	<u>25,552</u>	<u>25,603</u>
State of Texas	<u>16,986,510</u>	<u>20,851,820</u>	<u>23,407,629</u>	<u>23,904,380</u>
	<u>Percent Change</u>		<u>Percent Change</u>	
	<u>10 Years</u> '90-'00	<u>16 Years</u> '90-'06	<u>6 Years</u> '00-'06	<u>7 Years</u> '00-'07
Anderson city	NA	NA	7.8%	NA
Navasota city	7.8%	17.2%	8.7%	NA
Todd Mission city	170.4%	194.4%	8.9%	NA
Balance of County	<u>31.1%</u>	<u>42.2%</u>	<u>8.4%</u>	<u>NA</u>
Grimes County	<u>25.1%</u>	<u>35.7%</u>	<u>8.5%</u>	<u>8.7%</u>
State of Texas	<u>22.8%</u>	<u>37.8%</u>	<u>12.3%</u>	<u>14.6%</u>

SOURCE: U.S. Census Bureau, census 1990 and 2000 and estimates 2006 and 2007 (www.census.gov [June 2008]).

Table 3 shows the projected populations from both Grimes County and the state of Texas from the 2000 census year through 2010, 2020, 2030, and 2040. Both the county and the state are projected to increase in population through all of the projection years.

Data in **Tables 4** and **5** are from the U.S. Department of Commerce, Regional Economic Information System, Bureau of Economic Analysis, for the year 2006 and are based on the North American Industry Classification System (NAICS). The purpose of **Tables 4** and **5** is to

Table 3
Projected Population and Percent Changes
for Grimes County and the State of Texas

	Census Population 2000	Projected Population			
		2010	2020	2030	2040
Grimes County	23,552	27,233	31,227	34,662	37,449
State of Texas	20,851,820	24,330,612	28,005,788	31,830,589	35,761,201
		Percent Change			
		10 Years '00-'10	20 Years '00-'20	30 Years '00-'30	40 Years '00-'40
Grimes County		15.6%	32.6%	47.2%	59.0%
State of Texas		16.7%	34.3%	52.7%	71.5%

SOURCE: Texas State Data Center and Office of the State Demographer, Texas Population Estimates and Projections Program, 2006 projections based on the one-half 1990-2000 (0.5) scenario recommended for long-term planning (<http://txsdc.utsa.edu/tpepp/2006projections/> [June 2008]).

demonstrate the importance of health services as compared to the other industries in the economy of Grimes County and the state of Texas. In 2006, the health care and social assistance sector (which includes hospitals) accounted for 402 full- and part-time employees or 5.4 percent of the private employment in Grimes County (**Table 4**), compared to 10.5 percent for the state of Texas. For Grimes County, the health care and social assistance sector was the fifth largest sector of private employment with the same percent as professional and technical services and following manufacturing (#1), construction (#2), retail trade (#3), and other services, except public administration (#4).

Table 4
Full-Time and Part-Time Employment by Type of Employment and by Major Industry
(NAICS)¹ for Grimes County and the State of Texas, 2006

Employment Categories	Grimes County			State of Texas	
	Number of Jobs	% Total	% Private	% Total	% Private
Total FT & PT	<u>11,246</u>	<u>100.0%</u>		<u>100.0%</u>	
Wage & salary	7,098	63.1%		78.6%	
Proprietors'	<u>4,148</u>	<u>36.9%</u>		<u>21.4%</u>	
Farm proprietors'	1,715	41.3%		8.2%	
Nonfarm proprietors' ²	<u>2,433</u>	<u>58.7%</u>		<u>91.8%</u>	
By Industry:					
Farm	1,863	16.6%		2.0%	
Nonfarm	<u>9,383</u>	<u>83.4%</u>		<u>98.0%</u>	
Private	<u>7,405</u>	78.9%	<u>100.0%</u>	85.9%	<u>100.0%</u>
Forestry, fishing, related ³	(D)		**		0.6%
Mining	174		2.3%		2.4%
Utilities	215		2.9%		0.4%
Construction	905		12.2%		8.2%
Manufacturing	1,770		23.9%		8.6%
Wholesale trade	307		4.1%		4.9%
Retail trade	757		10.2%		12.7%
Transportation & warehousing	316		4.3%		4.4%
Information	68		0.9%		2.3%
Finance & insurance	249		3.4%		5.9%
Real estate rental & leasing	299		4.0%		5.0%
Professional & technical services	399		5.4%		7.5%
Mgmt of cos & enterprises	27		0.4%		0.6%
Admin & waste services	(D)		**		7.6%
Educational services	38		0.5%		1.6%
Health care & social assist	402		5.4%		10.5%
Arts, entertainment, & recreation	152		2.1%		1.8%
Accommodation & food services	360		4.9%		8.0%
Other services, not public admin	558		7.5%		<u>7.0%</u>
<i>Sum of (D) Categories⁴</i>	<u>409</u>		<u>5.5%</u>		
Govt & gov't enterprises	<u>1,978</u>	<u>21.1%</u>		<u>14.1%</u>	

SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis (www.bea.gov [June 2008]).

¹ The estimates are based on the North American Industry Classification System (NAICS).

² Excludes limited partners.

³ "Other" consists of the number of jobs held by U.S. residents employed by international organizations and foreign embassies and consulates in the U.S.

⁴ All (D) categories have been summed to show the total amount of missing data from private employment.

(D) Not shown to avoid disclosure of confidential information, but estimates are included in totals.

** Due to nondisclosure of confidential data, no percentages are available.

Table 5
Earnings by Place of Work and by Industry (NAICS)¹
for Grimes County and the State of Texas, 2006

Employment Categories	Grimes County			State of Texas	
	Income (\$1,000s)	% Total	% Private	% Total	% Private
Total earnings by place of work	<u>356,968</u>	<u>100.0%</u>		<u>100.0%</u>	
Wage & salary disbursements	252,114	70.6%		66.1%	
Proprietors' income ²	42,533	11.9%		18.8%	
Other	<u>62,321</u>	<u>17.5%</u>		<u>15.1%</u>	
Earnings by Industry					
Farm	2,978	0.8%		0.3%	
Nonfarm	<u>353,990</u>	<u>99.2%</u>		<u>99.7%</u>	
Private	<u>269,390</u>	76.1%	<u>100.0%</u>	85.3%	<u>100.0%</u>
Forestry, fishing, related ³	(D)		**		0.3%
Mining	12,248		4.5%		8.3%
Utilities	18,926		7.0%		2.3%
Construction	24,107		8.9%		7.8%
Manufacturing	111,783		41.5%		15.2%
Wholesale trade	12,020		4.5%		7.1%
Retail trade	13,177		4.9%		7.1%
Transp & warehousing	10,854		4.0%		5.2%
Information	3,181		1.2%		3.6%
Finance & insurance	7,136		2.6%		7.3%
Real estate rental & leasing	5,720		2.1%		3.1%
Prof & technical services	13,402		5.0%		10.3%
Mgmt of cos & enterprises	(L)		**		1.1%
Admin & waste services	(D)		**		4.5%
Educational services	317		0.1%		0.9%
Health care & social assist	13,713		5.1%		9.2%
Arts, entert, & recreation	2,573		1.0%		0.8%
Accomm & food services	4,361		1.6%		3.0%
Other services, not public admin	9,785		3.6%		<u>3.1%</u>
<i>Sum of (D) & (L) Categories⁴</i>	<u>6,087</u>		<u>2.3%</u>		
Govt & govt enterprises	<u>84,600</u>	<u>23.9%</u>		<u>14.7%</u>	

SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis (www.bea.gov [June 2008]).

¹ The estimates are based on the North American Industry Classification System (NAICS).

² Excludes limited partners.

³ "Other" consists of the number of jobs held by U.S. residents employed by international organizations and foreign embassies and consulates in the U.S.

⁴ All (D) categories have been totaled to show the total amount of missing data from private employment.

(D) Not shown to avoid disclosure of confidential information, but estimates are included in totals.

(L) Less than \$50,000, but the estimates for this item are included in the totals.

** Due to nondisclosure of confidential data, no percentages are available.

Personal income data are presented in **Table 5**. The health care services sector accounted for \$13.7 million or 5.1 percent of the private earnings in Grimes County which was the fourth largest sector of private earnings, preceded by manufacturing (#1), construction (#2), and utilities (#3). For the state of Texas, the health care services sector accounted for 9.2 percent of the private earnings and was the third largest sector in the state, preceded only by manufacturing and professional and technical services.

Table 6 compares the employment and payroll for the health services sector to the total of all other sectors for both Grimes County and the state of Texas. From the data, health services employment decreased 19.8 percent from 1998 to 2006 in Grimes County, while total county employment increased by 4.4 percent. Health services as a percent of total county employment decreased from 8.3 percent in 1998 to 6.3 percent in 2006, compared to the state's health services portion of state employment increasing from 12.0 percent in 1998 to 12.9 in 2006. Health services payroll in Grimes County grew 75.6 percent from 1998 to 2006, while the total county payroll increased by 28.7 percent. Health services as a percent of total county payroll grew from 4.3 percent in 1998 to 5.9 percent in 2006, compared to the state's health services payroll as a percentage of total state payroll increasing from 10.7 percent in 1998 to 11.6 percent in 2006.

The Direct Economic Activities

Employment and payroll are the important direct economic activities created in Grimes County from the health services sector. The health services sector is divided into the following components:

- Hospitals
- Offices of Physicians, Dentists, and Other Health Practitioners
- Nursing and Protective Services

Table 6
Employment and Payroll for County Business Patterns*
Grimes County and the State of Texas

Employment				
Based on NAICS ¹	Health Services Employment	Total County Employment	Health Services as a % of Total County Employment	Health Services as a % of Total State Employment
1998	364	4,412	8.3%	12.0%
1999	317	4,615	6.9%	11.8%
2000	198	5,066	3.9%	11.5%
2001	205	4,370	4.7%	11.6%
2002	268	4,859	5.5%	12.3%
2003	276	4,643	5.9%	12.7%
2004	275	4,153	6.6%	13.2%
2005	273	4,380	6.2%	13.2%
2006	292	4,607	6.3%	12.9%
% Chg '98 - '06	-19.8%	4.4%		
Payroll				
Based on NAICS ¹	Health Services Payroll (\$1,000s)	Total County Payroll (\$1,000s)	Health Services as a % of Total County Payroll	Health Services as a % of Total State Payroll
1998	5,404	125,434	4.3%	10.7%
1999	4,943	136,171	3.6%	10.5%
2000	4,606	144,435	3.2%	9.9%
2001	4,754	131,400	3.6%	10.4%
2002	7,131	117,371	6.1%	11.4%
2003	7,297	114,422	6.4%	11.8%
2004	8,108	130,712	6.2%	12.3%
2005	8,504	152,359	5.6%	12.1%
2006	9,492	161,407	5.9%	11.6%
% Chg '98 - '06	75.6%	28.7%		

Source: U.S. Census Bureau, County Business Patterns, 1998-2006 data (www.census.gov [July 2008]).

¹ The Health Care and Social Assistance NAICS sector comprises establishments providing health care and social assistance for individuals. The sector includes both health care and social assistance because it is sometimes difficult to distinguish between the boundaries of these two activities. Industries in this sector are arranged on a continuum starting with those establishments providing medical care exclusively, continuing with those providing health care and social assistance, and finally finishing with those providing only social assistance. The services provided by establishments in this sector are delivered by trained professionals. All industries in the sector shared this commonality of process, namely, labor inputs of health practitioners or social workers with the requisite expertise. Many of the industries in the sector are defined based on the educational degree held by the practitioners included in the industry.

* Data from County Business Patterns exclude self-employed persons, employees of private households, railroad employees, agricultural production workers, and for most government employees (except for those working in wholesale liquor establishments, retail liquor stores, Federally-chartered savings institutions, Federally-chartered credit unions, and hospitals).

- Home Health
- Pharmacies
- Other Medical and Health Services

The total health services sector in Grimes County employs 341 full- and part-time employees and has an estimated payroll including benefits of \$18.1 million (**Table 7**). The hospital component employs 102 people with an annual payroll of \$6.1 million. The hospital sector includes Grimes St. Joseph Health Center and Grimes St. Joseph Health Center Behavioral Unit. Grimes St. Joseph Health Center is a 25-bed acute care critical access hospital, providing inpatient and outpatient care, swing bed unit, a 24/7 emergency room, full laboratory services, medical imaging, nutrition counseling, outpatient rehabilitation services including physical and occupational therapy, cardiac rehabilitation, and specialty physicians' outpatient clinic. Grimes St. Joseph Health Center Behavioral Unit is a ten-bed geriatric-psychiatric unit with a psychiatrist on staff.

The physicians, dentists, and other health professionals' component includes 45 total employees with income of \$3.9 million. This component includes three family physician practices, one community health center, three dental practices, and three chiropractor practices.

The components of nursing and protective services, home health, and pharmacies have been combined with the other medical and health services' component to ensure the privacy of individual providers due to the small number of providers. This component includes 194 employees with income of \$8.1 million. The other medical and health services' component includes two nursing homes, two home health care agencies, two pharmacies, the health department, one mental health clinic, one physical therapy facility, one clinical pathology laboratory, school nurses, and two medical equipment providers. One medical equipment provider provides hearing systems and the other provides home care supplies.

Table 7
Direct Economic Activities of Health Services in Grimes County, Texas

Health Services	Total Full- & Part-Time Employment	Total Income* including Benefits
Hospitals (Includes Grimes St. Joseph Health Center and Grimes St. Joseph Health Center Behavioral Unit)	102	\$6,124,860
Physicians, Dentists, & Other Health Professionals (Includes 3 family physician practices, one community health center, three dental practices, and three chiropractor practice)	45	\$3,872,553
Other Health & Medical Services (Includes two nursing homes, two home health care agencies, two pharmacies, health department, one mental health clinic, one physical therapy facility, one clinical pathology laboratory, school nurses, two medical equipment providers [hearing systems and home care supplies])	<u>194</u>	<u>\$8,052,788</u>
Total Health Services	<u>341</u>	<u>\$18,050,201</u>

SOURCE: All employment data and income data for hospital only from local decision makers; all other income estimated from state average salaries from U. S. Department of Labor, Bureau of Labor Statistics, May 2007 State Occupational Employment and Wage Estimates for Texas (www.bls.gov [July 2008]).

* Income is defined as all personal income including wages, salaries, proprietor income, and benefits.

Notably, many rural communities have a large number of elderly, and the ranchers and farmers often retire in the towns. Thus, nursing and protective services are an important component of the health services sector. In summary, the health services sector is vitally important as a community employer and important to the community's economy. The health services sector definitely employs a large number of residents. The health services sector and the employees in the health services sector purchase a large amount of goods and services from

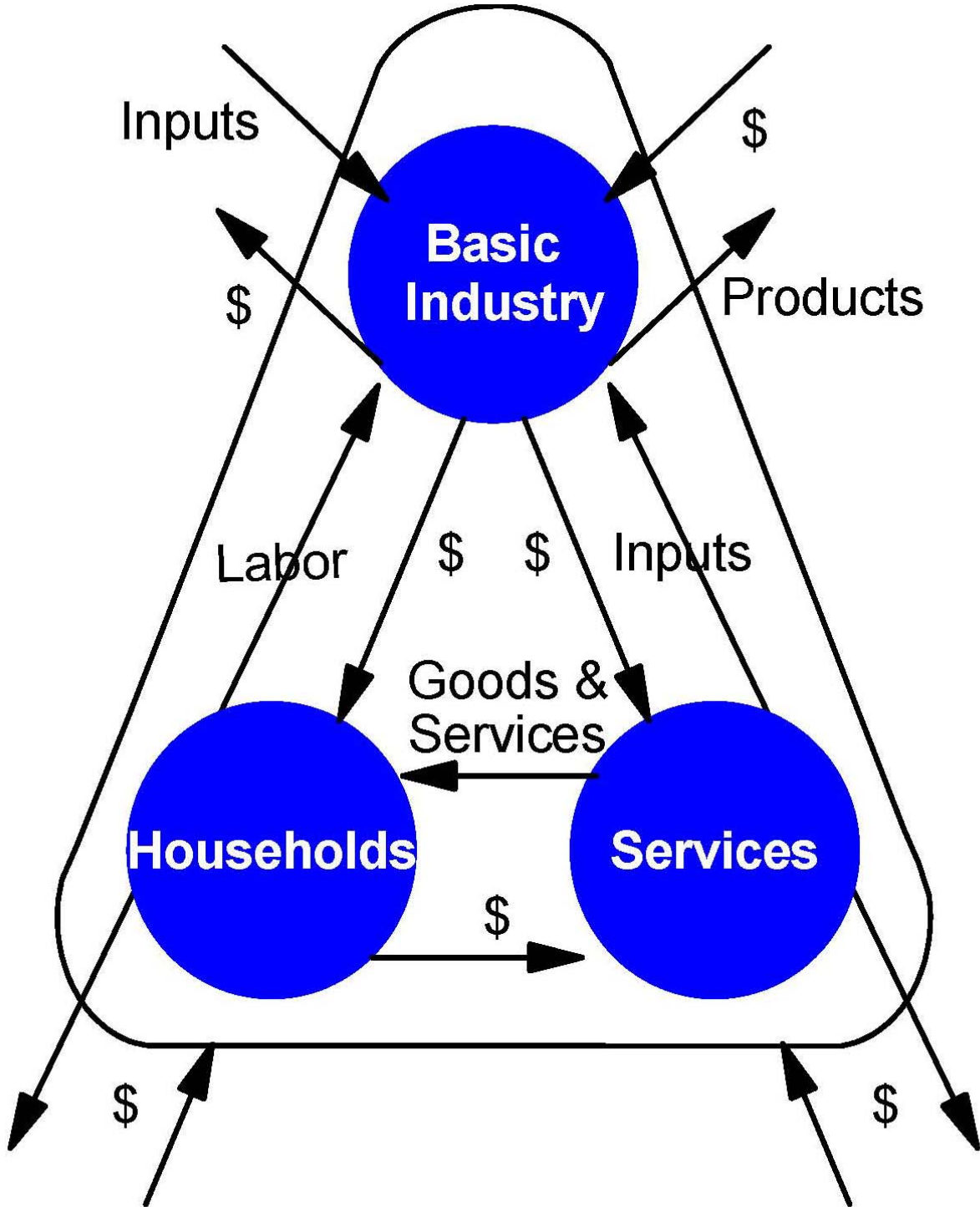
businesses in Grimes County. These impacts are referred to as secondary impacts or benefits to the economy. Before the secondary impacts of the health services sector are discussed, basic concepts of community economics will be discussed.

Some Basic Concepts of Community Economics and Income and Employment Multipliers

Figure 2 illustrates the major flows of goods, services, and dollars of any economy. The foundation of a community's economy are those businesses which sell some or all of their goods and services to buyers outside of the community. Such a business is a basic industry. The flow of products out of, and dollars into, a community are represented by the two arrows in the upper right portion of **Figure 2**. To produce these goods and services for "export" outside the community, the basic industry purchases inputs from outside of the community (upper left portion of **Figure 2**), labor from the residents or "households" of the community (left side of **Figure 2**), and inputs from service industries located within the community (right side of **Figure 2**). The flow of labor, goods, and services in the community is completed by households using their earnings to purchase goods and services from the community's service industries (bottom of **Figure 2**). **Figure 2** illustrates that a change in any one segment of a community's economy will have reverberations throughout the entire economic system of the community.

Consider, for instance, the closing of a hospital. The services sector will no longer pay employees and dollars going to households will stop. Likewise, the hospital will not purchase goods from other businesses and dollar flow to other businesses will stop. This decreases income in the "households" segment of the economy. Since earnings would decrease, households

Figure 2.
Community Economic System



decrease their purchases of goods and services from businesses within the "services" segment of the economy. This, in turn, decreases these businesses' purchases of labor and inputs. Thus, the change in the economic base works its way throughout the entire local economy.

The total impact of a change in the economy consists of direct, indirect, and induced impacts. Direct impacts are the changes in the activities of the impacting industry, such as the closing of a hospital. The impacting business, such as the hospital, changes its purchases of inputs as a result of the direct impact. This produces an indirect impact in the business sectors. Both the direct and indirect impacts change the flow of dollars to the community's households. The households alter their consumption accordingly. The effect of this change in household consumption upon businesses in a community is referred to as an induced impact.

A measure is needed that yields the effects created by an increase or decrease in economic activity. In economics, this measure is called the multiplier effect. Multipliers are used in this report. An employment multiplier is defined as:

the ratio between direct employment, or that employment used by the industry initially experiencing a change in final demand and the direct, indirect, and induced employment.

An employment multiplier of 3.0 indicates that if one job is created by a new industry, 2.0 jobs are created in other sectors due to business (indirect) and household (induced) spending.

Secondary Impacts of Health Services on the Economy of Grimes County, Texas

Employment and income multipliers for the area have been calculated by use of the IMPLAN model. It was developed by the U.S. Forest Service and is a model which allows for development of county multipliers. Additional information on IMPLAN is included in **Appendix A.**

The employment multipliers for the components of the health services are shown in **Table 8**. The employment multiplier for the hospital component is 1.32. This indicates that for each job created in that sector, a 0.32 job is created throughout the area due to business (indirect) and household (induced) spending. The employment multipliers for the other components are also shown in **Table 8**.

Table 8
Employment Impact of Health Services in Grimes County, Texas

Health Services	Number of Employees	Employment Multiplier	Secondary Impact	Total Impact
Hospitals	102	1.32	33	135
Physicians, Dentists, & Other Health Professionals	45	1.21	9	54
Other Health & Medical Services*	<u>194</u>	1.20	<u>39</u>	<u>233</u>
TOTALS	341		81	422

SOURCE: Local employment data for all health services; multipliers from IMPLAN 2006 data, Minnesota IMPLAN Group, Inc. (July 2008 [www.implan.com]).

*The multiplier for Other Health & Medical Services is based on four sectors from IMPLAN.

Applying the employment multipliers to the employment for each of the components yields an estimate of each component's employment impact on Grimes County (**Table 8**). For example, the hospital component has employment of 102 employees; applying the employment multiplier of 1.32 to the employment number of 102 brings the total employment impact of the hospital component to 135 employees ($102 \times 1.32 = 135$). The secondary impact of the hospital component is 33 employees ($102 \times 0.32 = 33$); these are the jobs created in other industry sectors in the Grimes County economy as a result of the spending of the hospital component and the spending of the 102 hospital component employees. The offices of physicians, dentists and other

health practitioners have a direct impact of 45 employees and after the application of the multiplier of 1.21, the secondary impact is 9 employees and the total impact comes to 54 employees. All the employment multipliers are applied in **Table 8**, resulting in a total employment impact of health services in Grimes County estimated at 422 employees and a secondary employment impact of 81 employees.

The income multiplier for the hospital component is 1.16 (**Table 9**). This indicates that for each dollar created in that sector, \$0.16 are created throughout the area due to business (indirect) and household (induced) spending. The income multipliers for the other health services' components are also given in **Table 9**.

Applying the income multipliers to the income (wages, salaries, and proprietor income plus benefits) for each of the components yields an estimate of each component's income impact on Grimes County (**Table 9**). The hospital component has a total payroll of \$6.1 million; applying the income multiplier of 1.16 brings the total hospital income impact to \$7.1 million ($\$6.1 \text{ million} \times 1.16 = \7.1 million). The secondary income impact from the hospital component is \$1.0 million, which is the income generated in the other industry sectors in the Grimes County economy due to the hospital component spending and the hospital component employees' spending. All the income multipliers are applied to the income for each component and the resulting secondary and total income impacts are shown for each component. The total secondary income impact of health services in Grimes County is estimated to be \$3.0 million, with the total income impact of health services in Grimes County estimated to be \$21.0 million (**Table 9**).

Table 9
Income¹ Impact of Health Services in Grimes County, Texas

Health Services' Component	Direct Impact	Multiplier	Secondary Impact	Total Impact	Retail Sales	1% Sales Tax
Hospitals	\$6,124,860	1.16	\$979,978	\$7,104,838	\$1,925,411	\$19,254
Physicians, Dentists, & Other Health Professionals	\$3,872,553	1.14	\$542,157	\$4,414,710	\$1,196,386	\$11,964
Other Health & Medical Services ²	<u>\$8,052,788</u>	1.18	<u>\$1,449,502</u>	<u>\$9,502,290</u>	<u>\$2,575,121</u>	<u>\$25,751</u>
TOTALS	<u>\$18,050,201</u>		<u>\$2,971,637</u>	<u>\$21,021,838</u>	<u>\$5,696,918</u>	<u>\$56,969</u>

SOURCE: Hospital income provided by local sources; income data for all other health services (except hospital) were estimated utilizing state average incomes from the U. S. Department of Labor, Bureau of Labor Statistics, May 2007 State Occupational Employment and Wage Estimates for Texas (www.bls.gov [July 2008]); multipliers from 2006 IMPLAN data, Minnesota IMPLAN Group, Inc. (www.implan.com [July 2008]).

¹ Income is defined as all personal income including wages, salaries, proprietor income, and benefits.

² The multiplier for Other Health & Medical Services is based on four sectors from IMPLAN.

Income also has an impact on retail sales. If the county ratio between retail sales and income continues as in the past several years, then direct and secondary retail sales generated by health services and its employees equals \$5.7 million (Table 9). Each of the components' income impacts were utilized to determine the retail sales and a 1.0 percent sales tax collection for each component. Then the health services' components are totaled to determine the direct and secondary retail sales generated by health services. A 1.0 percent sales tax collection is estimated to generate \$56,969 in Grimes County as a result of the total income impact (**Table 9**). This estimate is probably low, as many health care employees will spend a larger proportion of their income in local establishments that collect sales tax. The bottom line is that health services not only contributes greatly to the medical health of the community, but also to the economic health of the community.

Summary

The economic impact of health services upon the economy of Grimes County is tremendous. Health services employ a large number of residents, similar to a large industrial firm. The secondary impact occurring in the community is extremely large and measures the total impact of health services. If the health services increase or decrease in size, the medical health of the community as well as the economic health of the community are greatly affected. For the attraction of industrial firms, businesses, and retirees, it is crucial that the area have quality health services. Often overlooked is the fact that prosperous health services contribute to the economic health of the community.

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APPENDIX A

Model and Data Used to Estimate Employment and Income Multipliers

Appendix A Model and Data Used to Estimate Employment and Income Multipliers

A computer spreadsheet that uses state IMPLAN multipliers was developed to enable community development specialists to easily measure the secondary benefits of the health sector on a state, regional or county economy. The complete methodology, which includes an aggregate version, a disaggregate version, and a dynamic version, is presented in Measuring the Economic Importance of the Health Sector on a Local Economy: A Brief Literature Review and Procedures to Measure Local Impacts (Doeksen, et al., 1997). A brief review of input-output analysis and IMPLAN are presented here.

A Review of Input-Output Analysis

Input-output (I/O) (Miernyk, 1965) was designed to analyze the transactions among the industries in an economy. These models are largely based on the work of Wassily Leontief (1936). Detailed I/O analysis captures the indirect and induced interrelated circular behavior of the economy. For example, an increase in the demand for health services requires more equipment, more labor, and more supplies, which, in turn, requires more labor to produce the supplies, etc. By simultaneously accounting for structural interaction between sectors and industries, I/O analysis gives expression to the general economic equilibrium system. The analysis utilizes assumptions based on linear and fixed coefficients and limited substitutions among inputs and outputs. The analysis also assumes that average and marginal I/O coefficients are equal.

Nonetheless, the framework has been widely accepted and used. I/O analysis is useful when carefully executed and interpreted in defining the structure of a region, the interdependencies among industries, and forecasting economic outcomes.

The I/O model coefficients describe the structural interdependence of an economy. From the coefficients, various predictive devices can be computed, which can be useful in analyzing economic changes in a state, a region or a county. Multipliers indicate the relationship between some observed change in the economy and the total change in economic activity created throughout the economy.

MicroIMPLAN

MicroIMPLAN is a computer program developed by the United States Forest Service (Alward, et al., 1989) to construct I/O accounts and models. Typically, the complexity of I/O modeling has hindered practitioners from constructing models specific to a community requesting an analysis. Too often, inappropriate U.S. multipliers have been used to estimate local economic impacts. In contrast, IMPLAN can construct a model for any county, region, state, or zip code area in the United States by using available state, county, and zip code level data. Impact analysis can be performed once a regional I/O model is constructed.

Five different sets of multipliers are estimated by IMPLAN, corresponding to five measures of regional economic activity. These are: total industry output, personal income, total income, value added, and employment. Two types of multipliers are generated. Type I multipliers measure the impact in terms of direct and indirect effects. Direct impacts are the changes in the activities of the focus industry or firm, such as the closing of a hospital. The focus business changes its purchases of inputs as a result of the direct impacts. This produces indirect impacts in other business sectors. However, the total impact of a change in the economy consists of direct, indirect, and induced changes. Both the direct and indirect impacts change the flow of dollars to the state, region, or county's households. Subsequently, the households alter their consumption accordingly. The effect of the changes in household consumption on

businesses in a community is referred to as an induced effect. To measure the total impact, a Type II multiplier is used. The Type II multiplier compares direct, indirect, and induced effects with the direct effects generated by a change in final demand (the sum of direct, indirect, and induced divided by direct). IMPLAN also estimates a modified Type II multiplier, called a Type III multiplier that also includes the direct, indirect, and induced effects. The Type III multiplier further modifies the induced effect to include spending patterns of households based on a breakdown of households by nine difference income groups.

Minnesota IMPLAN Group, Inc. (MIG)

Dr. Wilbur Maki at the University of Minnesota utilized the input/output model and database work from the U. S. Forest Service's Land Management Planning Unit in Fort Collins to further develop the methodology and to expand the data sources. Scott Lindall and Doug Olson joined the University of Minnesota in 1984 and worked with Maki and the model.

As an outgrowth of their work with the University of Minnesota, Lindall and Olson entered into a technology transfer agreement with the University of Minnesota that allowed them to form MIG. At first, MIG focused on database development and provided data that could be used in the Forest Service version of the software. In 1995, MIG took on the task of writing a new version of the IMPLAN software from scratch. This new version extended the previous Forest Service version by creating an entirely new modeling system that included creating Social Accounting Matrices (SAMs) – an extension of input-output accounts, and resulting SAM multipliers. Version 2 of the new IMPLAN software became available in May of 1999. For more information about Minnesota IMPLAN Group, Inc., please contact Scott Lindall or Doug Olson by phone at 651-439-4421 or by email at info@implan.com or review their website at www.implan.com.